

Harness the Wind

Install wind generation with help from Generation Partners



Installing a renewable generation system is a powerful way to help the environment. A small residential wind turbine produces no pollution and can offset about 1.2 tons of air pollutants and 200 tons of greenhouse gases over its life span. Generation Partners from TVA and your local participating power company provides technical support and incentives for the installation of renewable generation systems such as wind turbines in the Tennessee Valley.

HOW WIND WORKS

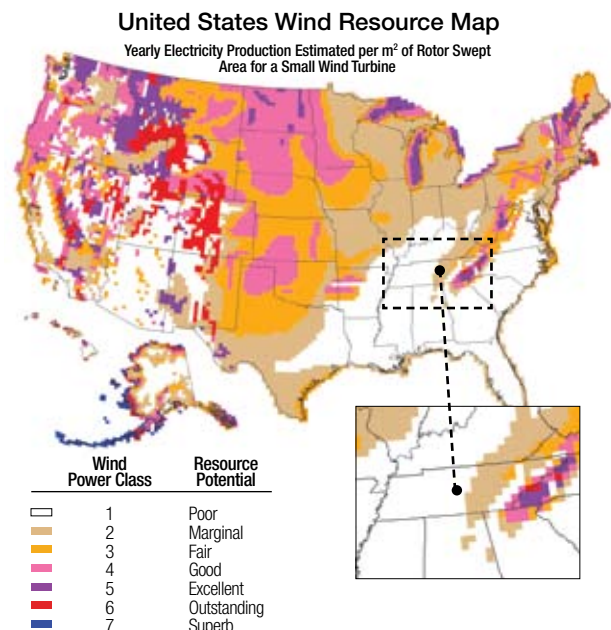
A wind turbine uses moving air to produce electricity by transferring the wind's momentum to the rotor blades and localizing that energy in a rotating shaft. Wind energy is nonpolluting and, if the turbines are sited properly, has minimal environmental impact. At about 55 decibels, a wind turbine is generally no noisier than a refrigerator.

WIND IN THE VALLEY

The Tennessee Valley has a few locations that can provide adequate, consistent wind speeds to allow the operation of wind turbines, as shown on the wind resource map at right. There are several important considerations:

- The proposed site and height of the turbines must provide adequate air movement.
- The wind speed must be at least 11 miles per hour at the height of the turbine.
- The tower needs to be located at least 300 feet away from and 30 feet above obstacles like hills, buildings, and trees.
- Zoning requirements and local height or aesthetic restrictions must be considered.

Application	System Sizes	Tower Type	Turbine Height
Residential	0.5-20 kW	Guyed	65-125 ft
Commercial	50 kW & above	Free standing	130-265 ft



*Edited with permission by the National Renewable Energy Laboratory, NREL. (2010)
 "Renewable Energy Technology Resource maps for the United States." www.nrel.gov*

Typical installation zones are 2-5. Wind speeds in zones 6-7 may exceed turbine capability and may need shorter tower height to prevent damage.

FINANCIAL INCENTIVES

TVA and your local power company will pay a one-time incentive of \$1,000 toward the system's cost. Federal and state incentives can further reduce your cost, although incentives can vary by state. For information, go to www.dsireusa.org.

System Size (kW)	Typical System Cost Before Incentives (\$/kW)
0.5 - 5	\$8,000 - \$10,000
5 - 20	\$6,000 - \$8,000
50 -1000	\$3,000 - \$6,000

POWER PAYMENTS

Generation Partners guarantees a 10-year payment at the utility rate (retail rate for residential; GSA1 rate for commercial) plus an additional 3 cents per kilowatt-hour (kWh) for the power you generate. If utility rates increase or decrease, so does your payment.

SYSTEM COST: RESIDENTIAL EXAMPLE (applicable for Tennessee)	
System size: 2.5 kW	Initial Cost: \$20,000
Net cost after incentives	\$13,000*
Estimated annual energy production	3,035 kWh**
Estimated annual generation credit	\$395***
* Assuming 30% federal tax credit + \$1,000 (TVA). ** Assuming 11.5 ft. rotor dia. + 12 mph wind speed (see equation for more detail). *** Assuming \$0.13/kWh generation rate.	

SYSTEM COST: COMMERCIAL EXAMPLE (applicable for Tennessee)	
System size: 50 kW	Initial Cost: \$250,000
Net cost after incentives	\$121,500*
Estimated annual energy production	65,820 kWh**
Estimated annual generation credit	\$9,215***
* Assuming 30% federal tax credit/grant + TN grant + \$1,000 (TVA) (TN grant is taxed at 30% tax rate, equipment depreciation not calculated). ** Assuming 42.5 ft. rotor dia. + 14 mph wind speed (see equation below for more detail). *** Assuming \$0.14/kWh generation rate.	

A CLOSER LOOK AT WIND TECHNOLOGY

Wind speed, height, and rotor size

A small increase in tower height results in a dramatic increase in wind speed (see graph at top right). The equation below demonstrates the impact that rotor diameter and wind speed have on energy output.

Calculating wind energy production

$$AEO = 0.01328 \times D^2 \times V^3$$

AEO = Annual energy output (kWh/year)

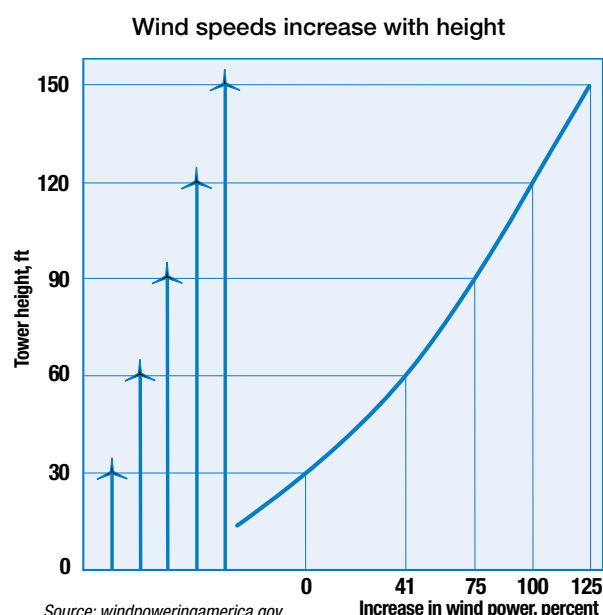
D = Rotor diameter (ft.)

V = Average annual wind speed (mph)

Evaluating your wind resource

The most accurate approach for evaluating your local wind resource is to perform a one-year wind

study at the exact height and site of the proposed wind turbine location. For smaller systems where a wind study may be cost- or time-prohibitive, you can evaluate data from other sources such as an airport or make wind speed predictions from topography maps.



Maintenance and warranty

Larger systems (50 kW and above) include equipment warranties and operations-and-maintenance service contracts as part of a standard offer. The duration of these agreements can be negotiated beyond the standard five-year contract term. Smaller systems (0.5 – 20 kW) typically do not provide these same guarantees.

MORE INFORMATION

Learn more about wind power at these websites, and find out how you can help the environment by becoming a Generation Partners participant.

Generation Partners: www.generationpartners.com

Tennessee Wind Working Group:
www.tennesseewind.org

Small systems: www.awea.org/smallwind

Wind energy info: www.nrel.gov/learning/re_wind.html

Wind and hydro technologies:
www.eere.energy.gov/windandhydro

Wind Powering America Initiative:
www.windpoweringamerica.gov